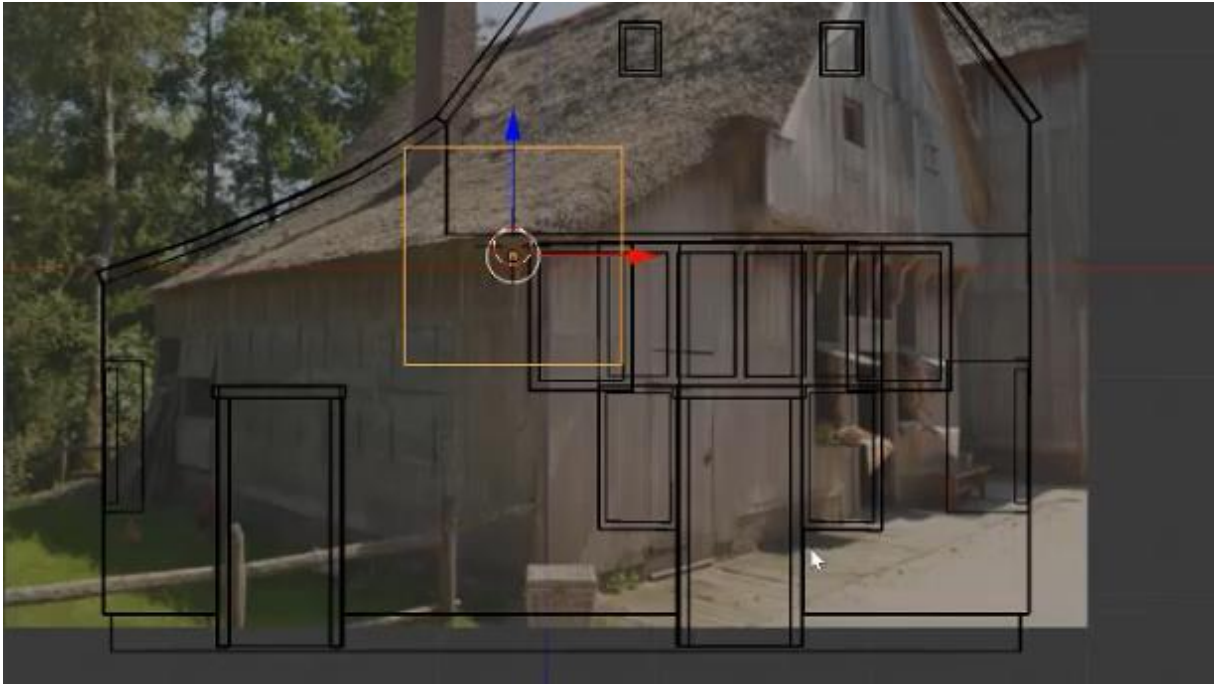


Chapter 4, lesson 49, Adding windows

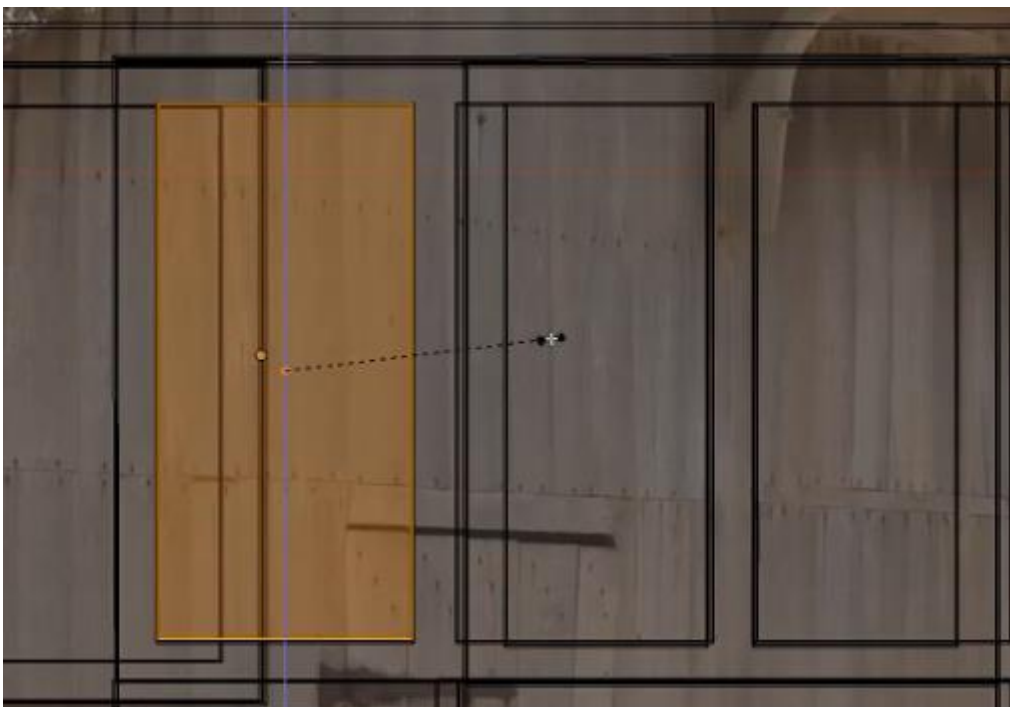
In this chapter we will use a different way of making textures. We will use maps to create details and build up our windows for the building. We discuss texture maps and learn some more about the object origin as a sidetrack.

Chapter 4, lesson 49, Adding windows

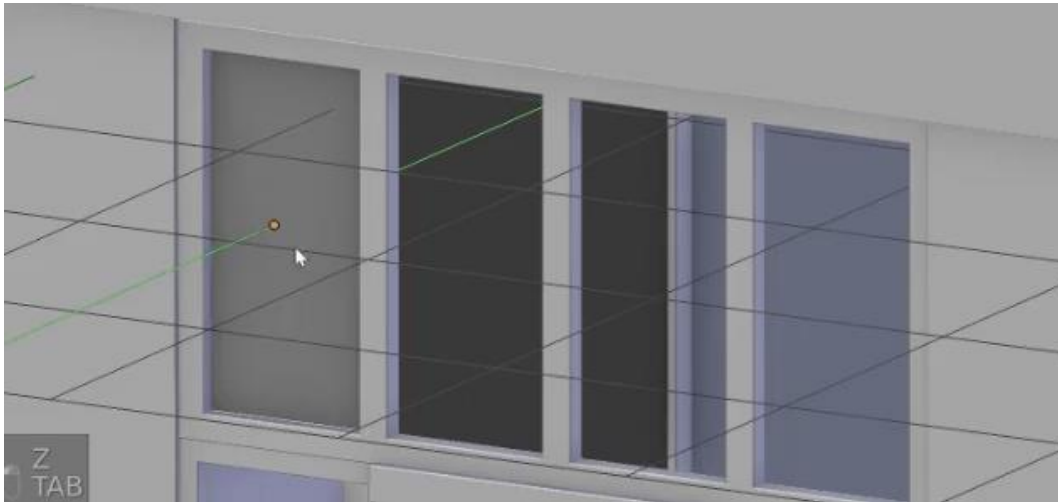
Windows are an important part of a building. They give it life by reflecting the environment. From the front view we add a new mesh and select plane. Use snapping and rotate it 90 degrees on the X axis so that it is aligned with the wall.



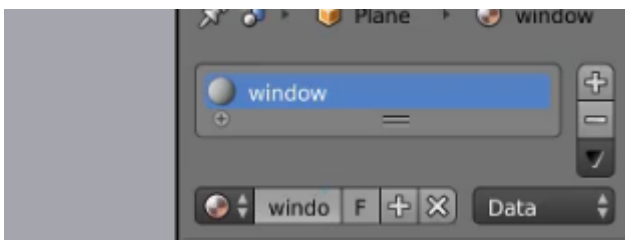
Drag it out of the building so that it is in front. Then we will put it in position and go into edit mode to adjust its size to fit our first window. If you have a hard time seeing in wireframe mode what window will be the reference toggle between wireframe and solid view to make sure you are not modelling with a window from the rear as your reference. Make sure that it fits near perfect in the frame.



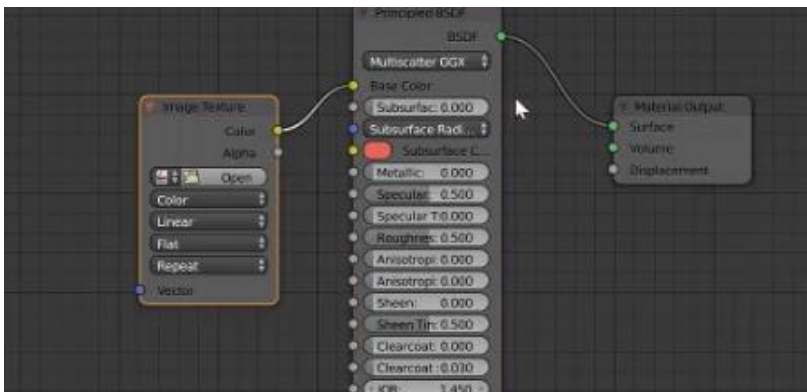
Grab the plane and move it inside the first frame.



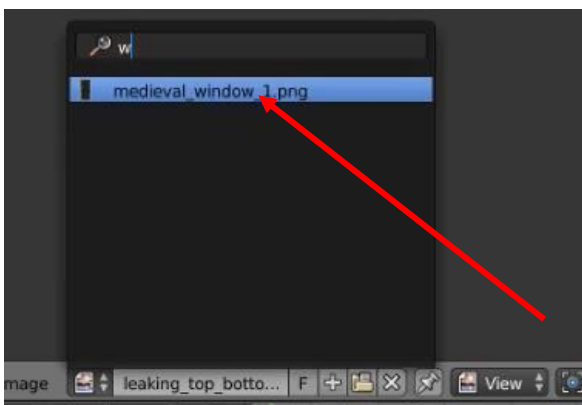
From here, add a new material to the plane and call it “window”.



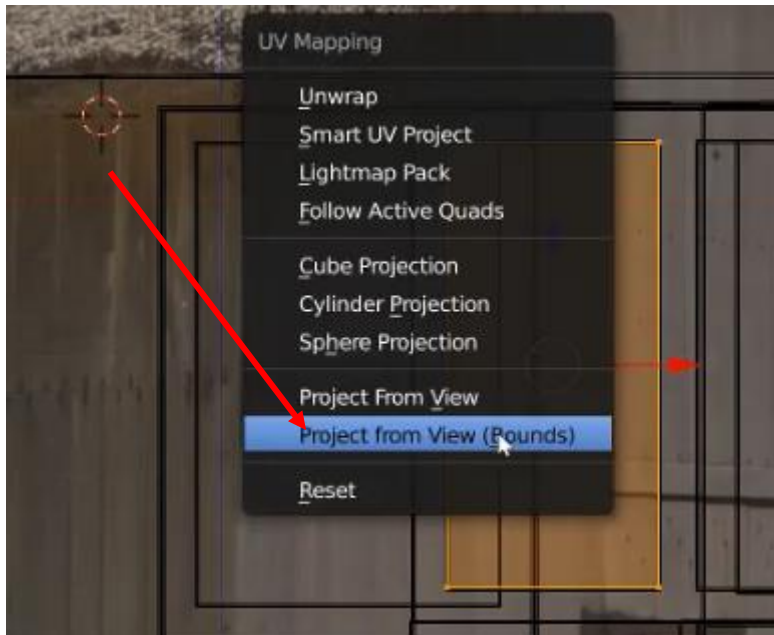
If you have not already, open the node editor and setup an image texture, connected to a principled shader and the principled into the material output.



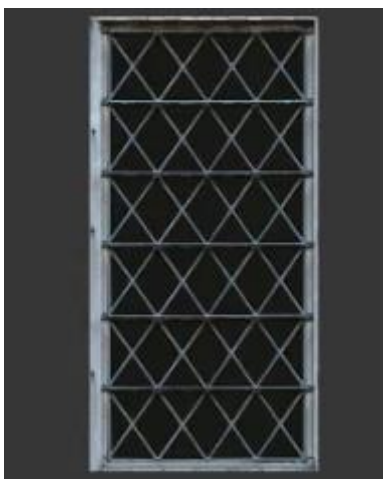
For the image texture open the texture called “medieval_window_1.png” from the course material. From here we open the UV/Image editor and select the window texture to show in the editor.



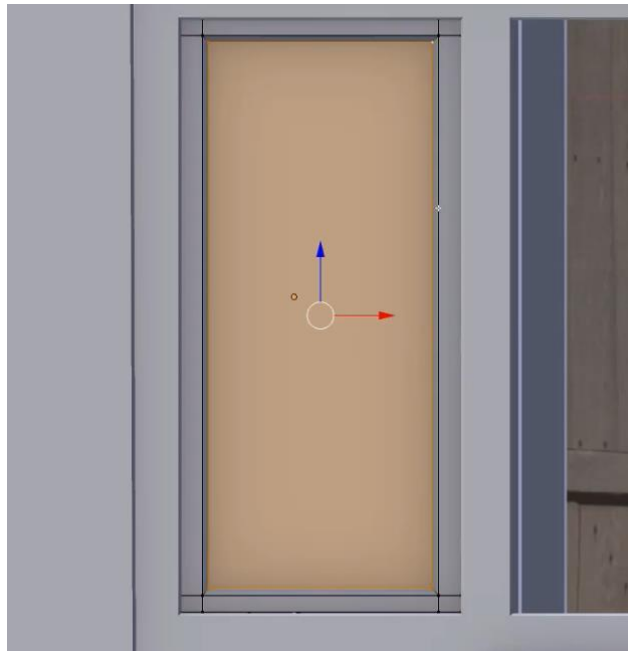
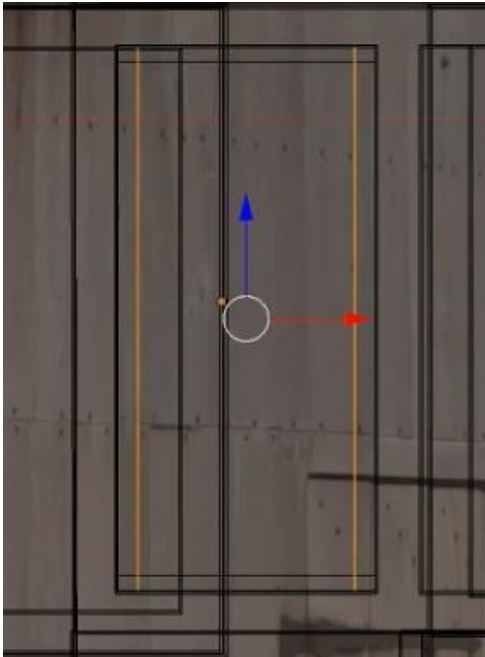
Now we will go back to the 3D view, select the plane, go into edit mode and UV-project the plane. Use the hotkey “U” to bring up the UV Mapping menu. This time we will use the “Project from view(Bounds)” option. This option will not only project from our view but also scale the UV-coordinates to fit the image perfectly. Make sure that you are in front orthographic view when you do this.



If we take a closer look at our texture we see that it resembles a photo of a window, not an actual window texture. It has multiple materials like the wood frame, the glass windows and the metallic pattern. We can see that the depth of the texture would vary in real life. Therefore, we need to make some adjustments to the plane to have these changes in depth and difference in material. This can be done by using different kinds of maps to map out what areas do what. Working with texture maps and the principled shader is a perfect match because its inputs are really tailored to take in industry standard types of maps and output something called a PBR material. A Physically Based Render.

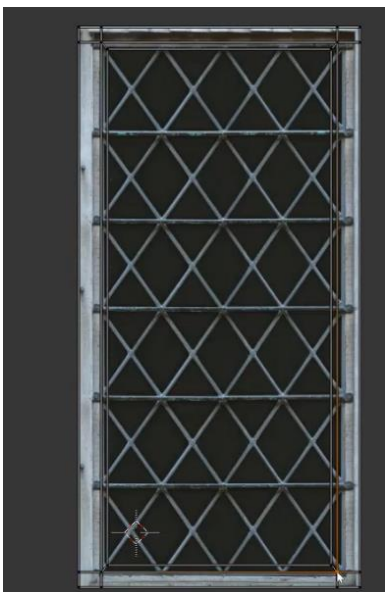


Let us start by doing some adjustments to our plane. We will create the border around the window. We do this by adding two loop cuts across the plane with “**ctrl+r**” scroll the mouse wheel once. Then scale the new edges on the Z axis by using “**S**” and constrain with “**Z**”. Do the same for the top to bottom direction so that we end up with a plane that has these edges internally.



From here select the inner face either by selecting the four inner vertices or by going into face select and select the single middle face. Hit “**E**” to extrude this slightly into the building. Then hit “**S**” to scale it a bit so that we end up with an angled border around the window.

Now we will have to reproject the UV-map. Select the whole window again and hit “**U**” and use “Project from view(Bounds)” again. Our changes will be reflected in the UV/Image editor.



From here we will do some tweaking of the UV-map so that the correct part will have the correct texture. We have a border of faces encompassing the middle face. This set of faces will need to be moved out to be projecting the wooden frame instead of the window. Make sure to grab both

vertices in a corner to keep the 45-degree angle and move them outwards. Do this for all four corners.

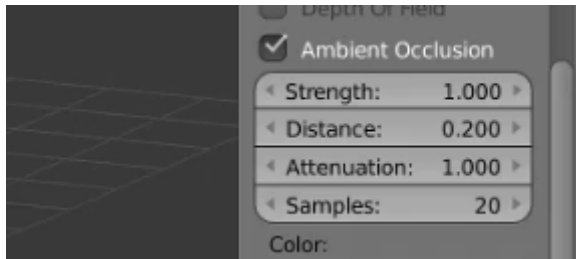
Now we can see the result of our work in the material shading. These small details make a huge difference in the end. The number one resource that we have when we are making 3D models is time. We spend this time to take good care of the small details and think through our decisions.



We can now duplicate over our window with “**shift+d**” to fill in the frames above the door.



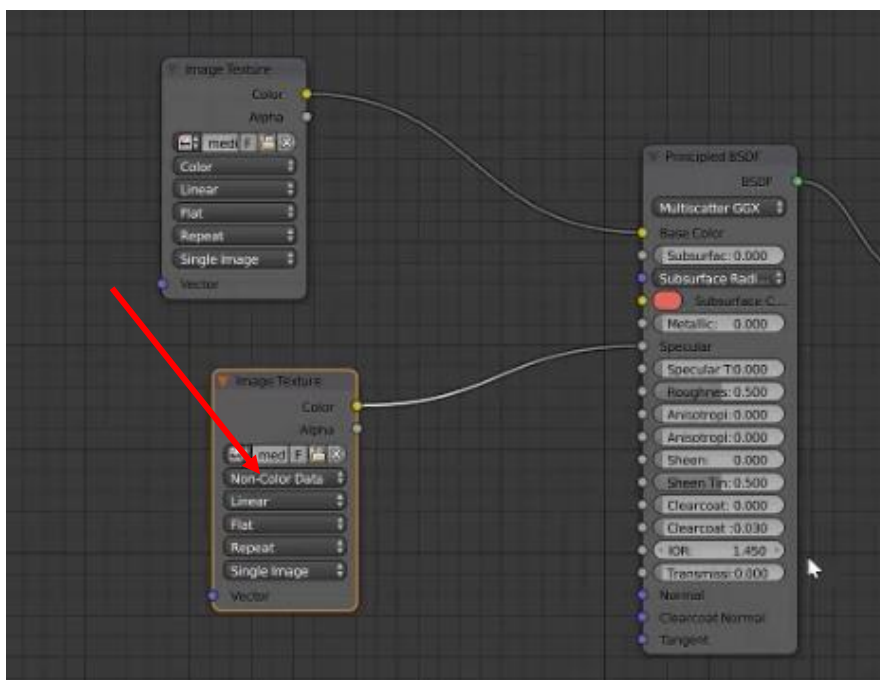
In an earlier lesson we enabled the ambient occlusion in the viewport. When we are dealing with these details it can really help us to get a feel for how our detail work is doing. As a reminder this is available in the 3D viewports N-panel under the shading section.



Right now, we have the diffuse texture added to our material for the windows. If we are going to be able to adjust other properties other than the color of the texture, we will need to include our other maps. Texture maps can be a whole topic and even career on its own and there are many different workflows available to us. The workflow you choose and what maps you chose to include or not is up to the artist but there are some maps that are more common than others. Some very common maps are for instance a normal map, a roughness map and a metallic map. These maps together with the diffuse map or an albedo map is generally used in what is known as the metallic/roughness workflow. We also have the specular/gloss workflow and a whole lot of other arrangements. For now, we will stick to the normal map to give us angle data. It is different from a height map or bump map that give us height information. The normal map gives us angles for the light to reflect towards when it hits the surface. In other words, when a light ray hits the surface, the normal map dictates the angle it will bounce off.

To accompany the normal map, we will also use a specular map in this case. When used in conjunction with a principled shader it dictates how reflective a surface is between the most common range of 0% and 8%. A white value will be 8% reflective and a black value will be 0%. This value is in relation to the value known as IOR or index of refraction. This is all quite technical, but I chose to include it so that you can understand that this may not be a very straight forward value.

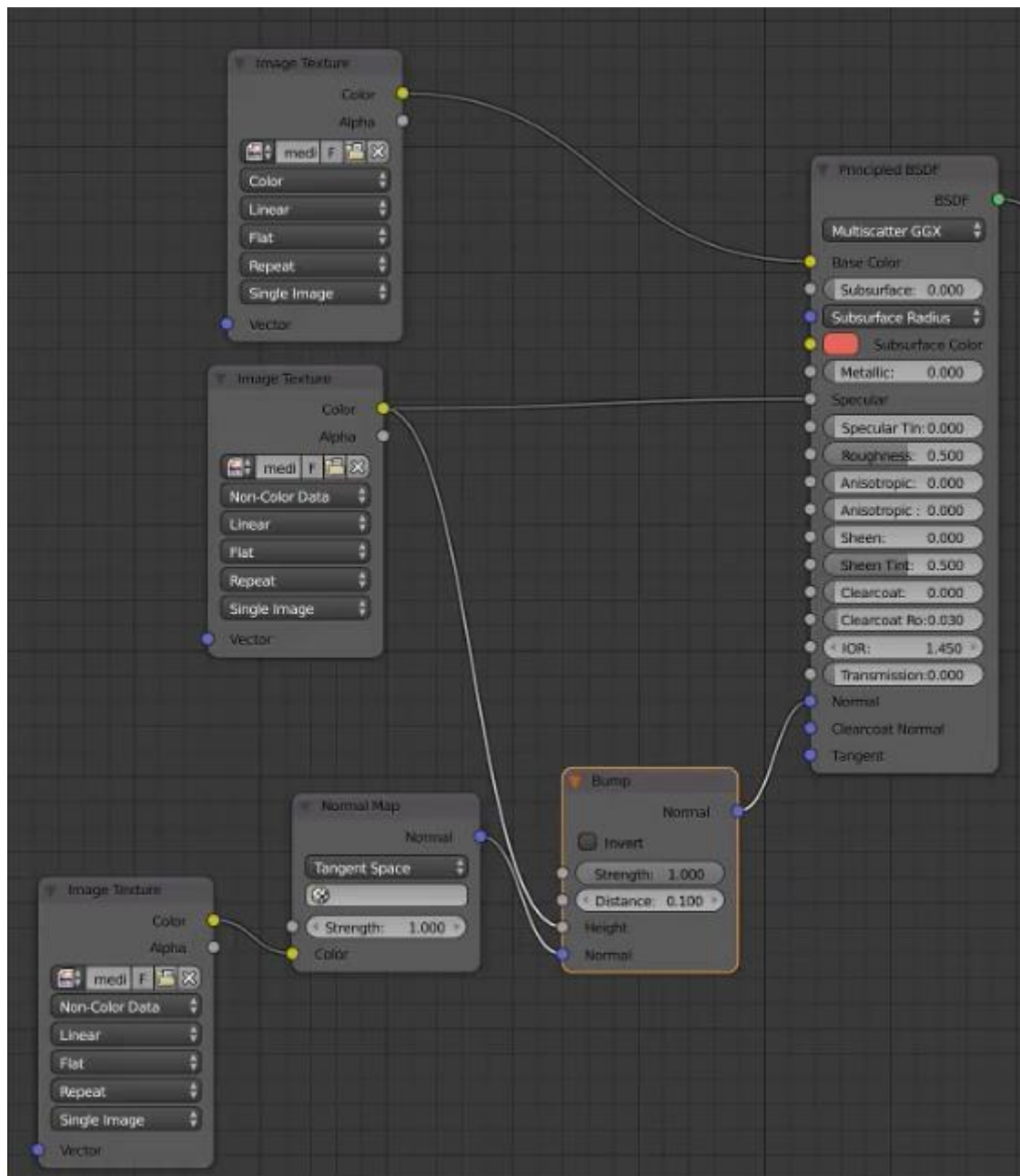
We start by adding the specular map. Duplicate the image texture and browse for the medieval_window_1_MASK.png file. Then set the image texture node from being color data to non-color data. All the maps except the diffuse map should be set to non-color data or we may experience quite odd results. This is especially true for the normal map that we will soon add as well.



Let us continue by adding in the normal map. Duplicate the specular image texture this time and browse it for the “medieval_window_1_NOR.png” file. It should be a blue colored map. The color comes from the RGB values in the image that is translated to XYZ coordinates for the light that hits it to give it an outgoing direction. Blender needs a normal map node to be able to tell that this conversion from RGB to XYZ shall take place. Also add a bump node.

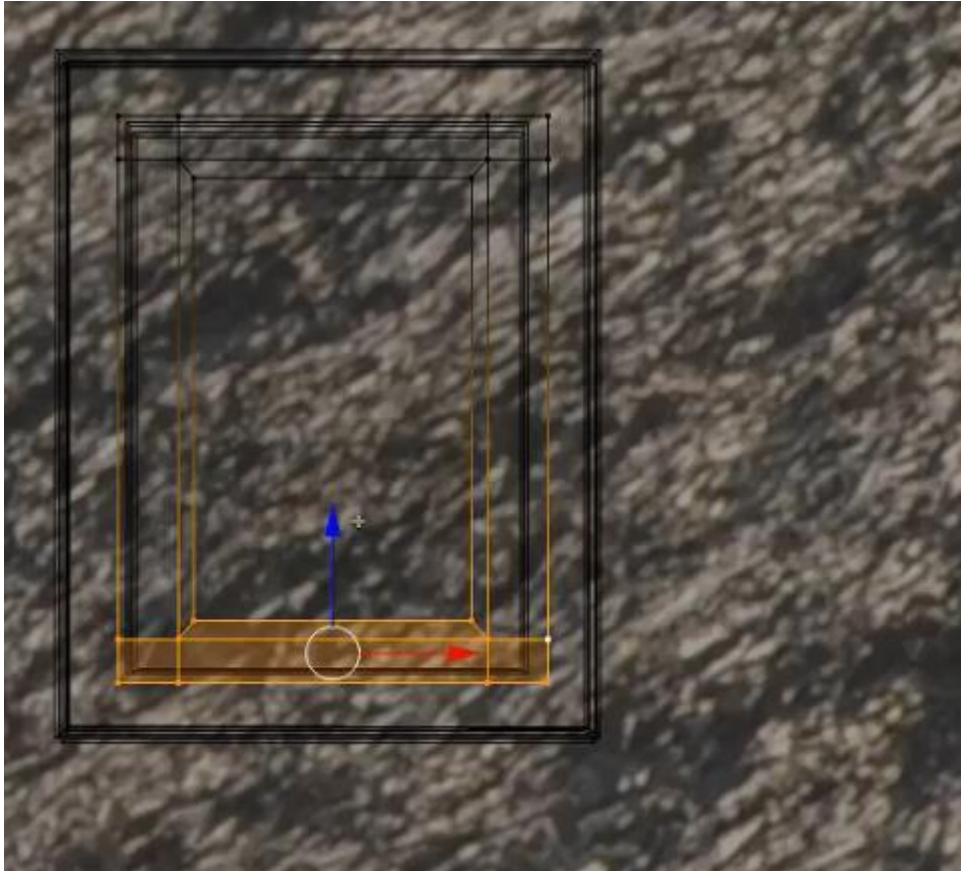
Connect the image texture with the normal map to the color input of the normal map node, then connect the normal map node into the normal input of the bump node. Here we will cheat a bit by using our specular data as a bump map to generate some height information through the bump node. This way we don't have to worry about creating another texture to be the height information.

Now connect the bump node to the normal input of the principled shader so that the node tree looks like this.

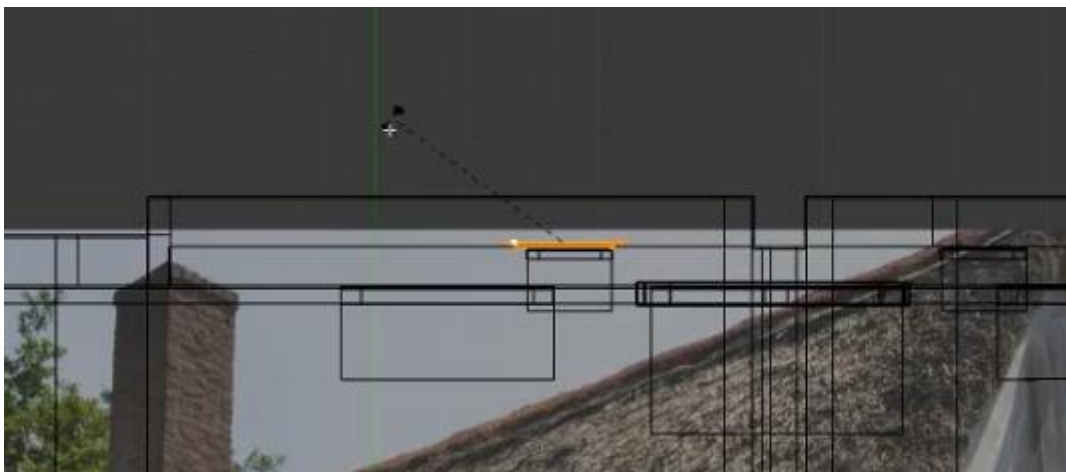


This will conclude the window material. You can get a preview of how it's going to look by disconnecting and connecting the maps one at a time into the principled shader while viewing in the material shaded view in the viewport. But the real magic happens when we light the scene with an HDRI image.

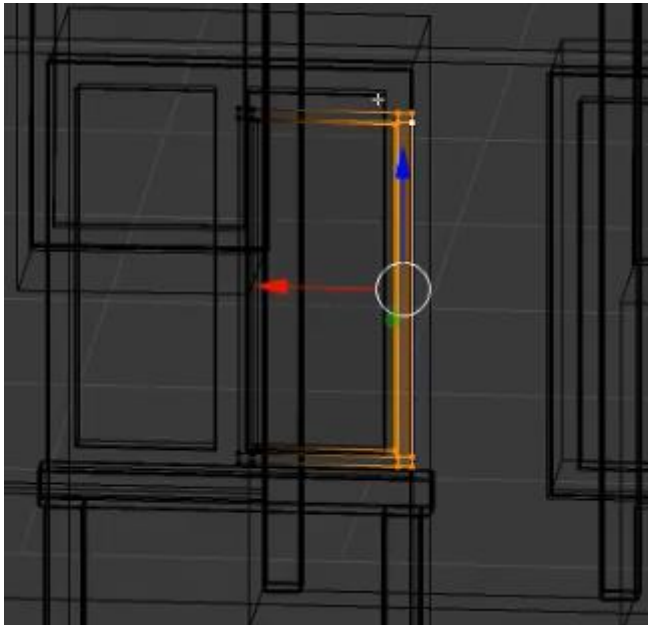
We will continue by duplicating and scaling one of our windows to the top window frames. Adjust it in editmode so that the frames are still wide enough.



When the top windows are done we will copy one of the larger windows over to the rear of the building. Rotate it around by using “R” and hold “ctrl” or toggle snapping on the magnet icon to rotate it an exact 180-degrees.



Adjust the window to fit inside one of the frames above the door.



If you have trouble selecting only the parts of this window you can make it a separate object from the other windows. Do this by selecting a vertex of the window and hit **“ctrl+L”** to select the window, then hit **“P”** and chose **“selection”** to make the selected parts its own object.

For good measure we should relocate the objects origin. The origin is the orange dot that follows your object around. It is the center of gravity and rotations are normally done around this point of the object. We can move the origin point to any location we want. One way is to move the object in object mode. That will move your origin along for the ride. In edit mode the origin point will never be moved.

Blender has a few tools to help us set the location of this point. To access them go to object mode and use the somewhat convoluted shortcut **“alt+ctrl+shift+C”** This shortcut even has a nickname in the Blender community that is **“The claw grip”**. I always wondered how it got that name. Anyway, in the menu that pops up you have a few options to set the origin point. For now, chose the **“Set origin to geometry”** That way Blender will calculate the middle of your mesh and set the origin to that place. This will make us able to rotate in a more predictable way in object mode.

Now while we are talking about the origin point I should also mention that you have the option to set the origin to the 3D cursor and this can be very handy in conjunction with the snap menu. Hit **“shift+s”** to bring it up. It is available in both edit and object mode which means that if we for instance use the **“cursor to selected”** option we can then set the origin to an exact point in our mesh. This has a lot of good use cases. For instance, you could set the origin to the base of your building once it is done and snap it to the ground in a controlled way.

Now we have been sidetracked long enough. We have a window that is its own object and the origin is centered to it. Duplicate it over to cover both window frames above the door as well as the smaller windows on the second floor. This concludes this lecture.